AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims to the application.

1. (Withdrawn) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides a means for enabling the image sensor to compensate for a variation in each pixel output by using a sensor signal output from the corresponding light sensor circuit with shut-off incident light to the photoelectric element when a gate voltage and a drain voltage of the transistor are changed over to respective values lower than normal values for taking video by the image sensor.

2. (Withdrawn) An output compensating device of an image sensor as defined in claim 1, wherein a sensor signal obtained by changing the gate voltage and the drain voltage of the transistor of the light sensor circuit to respective values lower than the normal values for taking video corresponds to a sensor signal obtainable in a bright state when taking video and is gain-compensated to have a correct bright output level.

3. (Withdrawn) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the sensor current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides a means for enabling the image sensor to compensate for variations in each pixel output by using a first sensor signal obtainable by setting a gate voltage and a drain voltage of the transistor with shut-off incident light to the photoelectric converting element to normal values when taking video by the image sensor and by using a second sensor signal obtainable by changing the gate voltage and the drain voltage of the transistor to values lower than the normal values when taking video.

4. (Withdrawn) An output compensating device of an image sensor as defined in claim 3, wherein the first sensor signal corresponding to a sensor signal obtainable in a dark state when taking video is used for offset compensation for variations in each pixel output level in the dark state and the second sensor signal corresponding to a sensor signal obtainable in a bright state when taking video is used for gain compensation for variation in each pixel output level in the bright state when taking video.

5. (Withdrawn) An output compensating device of an image sensor as defined in any of claims 1 and 3, wherein ranges of changing the gate voltage and the drain voltage of the transistor to be lower than the normal values when taking video are of zero to values determined by subtracting a threshold voltage of the transistor from the normal values respectively.

6. (Original) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and capable of producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides a means for enabling the image sensor to compensate for variations in each pixel output by using a sensor signal obtained by conducting the transistor by changing its gate voltage to a value higher than normal values when taking video.

7. (Original) An output compensating device of an image sensor as defined in claim 6, wherein a sensor signal obtainable by changing the gate voltage of the transistor to a value higher than the normal value when taking video corresponds to a sensor signal obtainable in the dark state when taking video and is used for offset compensation for variation in the pixel output in the dark state.

8. (Original) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and working by producing in a photoelectric converting

element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides means for enabling the image sensor to previously set a drain voltage of the transistor of each light sensor circuit to a value at which a sensor signal obtained by conducting the transistor with its gate voltage changed to a value higher than a normal value may correspond to a sensor signal obtainable in a dark state of the light sensor circuit with the normal gate voltage of the transistor when taking video, and thereafter perform compensation for variations in output of each pixel signal by using a sensor signal obtainable from the light sensor circuit by changing the gate voltage of the transistor with the preset drain voltage to a value higher than the normal value for taking video.

9. (Original) An output compensating device of an image sensor as defined in claim 8, wherein offset compensation for variations in dark-state output levels of pixel signals is performed by using sensor signals obtainable by conducting the transistors with the drain voltage of the preset value and the gate voltage changed to a value higher than the normal value for taking video, which signals correspond to sensor signals obtainable in the dark state for taking video.

10. (Original) An output compensating device of an image sensor as defined in claim 9, wherein gain-compensation for variations in bright-state output levels of pixel signals is performed by using sensor signals obtainable by changing the gate voltage and the drain voltage of the transistor with shut-off incident light to the photoelectric converting element to values lower than the normal values for taking video, which signals correspond to sensor signals obtainable in a bright state for taking video.

11. (Original) An output compensating device of an image sensor as defined in claim 10, wherein ranges of changing the gain voltage and the drain voltage of the transistor to be lower than the normal voltages for taking video are of zero to values determined by subtracting a threshold voltage of the transistor from the normal gain voltage value and drain voltage value respectively.

12. (Withdrawn) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides means for enabling the image sensor to compensate for variations in levels of respective pixel outputs in a dark state and a bright state by using as a dark-state pixel output a sensor signal obtained from each of the light sensor circuits when conducting the transistor with its gate voltage changed to a value higher than a normal value and its drain voltage equal to a normal value for taking video, and by using as a bright-state pixel signal a sensor signal obtainable by changing the drain voltage of the transistor to a value lower than the normal value for taking video.

13. (Withdrawn) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides a compensating means for enabling the image sensor to previously set a drain voltage of the transistor to a value at which a sensor signal obtained when conducting the transistor by changing its gate voltage to a value higher than a normal value for taking video may correspond to a sensor signal obtainable in a dark state at a normal gate voltage of the transistor and thereafter to compensate for variations in dark-state output level of each pixel signal by using as the dark-state pixel signal a sensor signal obtainable by changing the gate voltage of the transistor to a value higher than the normal value as a dark-state pixel signal and for variations in bright-state output level of each pixel signal by using as the bright-state pixel signal a signal obtainable by changing the drain voltage of the transistor to a value lower than the preset value.

14. (Withdrawn) An output compensating device of an image sensor as defined in any of claims 12 and 13, which provides an initializing means for initializing each of the pixels before taking

video by discharging a charge accumulated in a parasite capacitor of each of the photoelectric elements by changing the drain voltage of the current-to-voltage converting transistor to a value lower than a normal value for a specified period.

15. (Withdrawn) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides a means for enabling the image sensor to sample and hold sensor signals read in a time series from respective pixels, obtaining pseudo bright output signals by decreasing by a threshold value the normal drain voltages of the respective transistors corresponding to respective pixels, calculating a difference between each of the obtained pseudo bright output signals and the corresponding sensor signals temporarily stored in the sample-and-hold circuit, and conducting the offset compensation of the previously set bright reference signal by using the determined difference as the offset value.

16. (Withdrawn) A method of compensating for the outputs of a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of compensating for a variation in each pixel output by using a sensor signal output from the corresponding light sensor circuit with shut-off incident light to the photoelectric element when a gate voltage and a drain voltage of the transistor is changed over to respective values lower than normal values for taking video by the image sensor.

17. (Withdrawn) A method of compensating for outputs of light sensor circuits of an image sensor as defined in claim 16, wherein a sensor signal obtained by changing the gate voltage and the drain voltage of the transistor of the light sensor circuit to respective values lower than the

normal values for taking video corresponds to a sensor signal obtainable in a bright state when taking video and is gain-compensated to have a correct bright output level.

18. (Withdrawn) A method of compensating for the outputs of a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the sensor current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of compensating for variations in each pixel output by using a first sensor signal obtainable by setting a gate voltage and a drain voltage of the transistor with shut-off incident light to the photoelectric converting element to normal values when taking video by the image sensor and by using a-second sensor signal obtainable by changing the gate voltage and the drain voltage of the transistor to values lower than the normal values when taking video.

19. (Withdrawn) A method of compensating for the outputs of light sensor circuits of an image sensor as defined in claim 18, wherein the first sensor signal corresponding to a sensor signal obtainable in a dark state when taking video is used for offset compensation for variations in each pixel output level in the dark state and the second sensor signal corresponding to a sensor signal obtainable in a bright state when taking video is used for gain compensation for variation in each pixel output level in the bright state when taking video.

20. (Withdrawn) A method of compensating for the outputs of light sensor circuits of an image sensor as defined in any of claims 16 and 18, wherein ranges of changing the gate voltage and the drain voltage of the transistor to be lower than the normal values when taking video are of zero to values determined by subtracting a threshold voltage of the transistor from the normal values respectively.

21. (Original) A method of compensating for the outputs of a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and capable of producing in a photoelectric converting element a sensor current proportional to a quantity of light falling

thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of compensating for variations in each pixel output by using a sensor signal obtained by conducting the transistor by changing its gate voltage to a value higher than normal values when taking video.

22. (Original) A method of compensating for the outputs of light sensor circuits of an image sensor as defined in claim 21, wherein a sensor signal obtainable by changing the gate voltage of the transistor to a value higher than the normal value when taking video corresponds to a sensor signal obtainable in the dark state when taking video and is used for offset compensation for variation in the pixel output in the dark state.

23. (Original) A method of compensating for the outputs of a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of previously setting a drain voltage of the transistor of each light sensor circuit to a value at which a sensor signal obtained by conducting the transistor with its gate voltage changed to a value higher than a normal value may correspond to a sensor signal obtainable in a dark state of the light sensor circuit with the normal gate voltage of the transistor when taking video, and thereafter performing compensation for variations in output of each pixel signal by using a sensor signal obtainable from the light sensor circuit by changing the gate voltage of the transistor with the preset drain voltage to a value higher than the normal value for taking video.

24. (Original) A method of compensating for the outputs of light sensor circuits of an image sensor as defined in claim 23, wherein offset compensation for variations in dark-state output levels of pixel signals is performed by using sensor signals obtainable by conducting the transistors with the drain voltage of the preset value and the gate voltage changed to a value

higher than the normal value for taking video, which signals correspond to sensor signals obtainable in the dark state for taking video.

25. (Original) A method of compensating for the outputs of light sensor circuits of an image sensor as defined in claim 24, wherein gain-compensation for variations in bright-state output levels of pixel signals is performed by using sensor signals obtainable by changing the gate voltage and the drain voltage of the transistor with shut-off incident light to the photoelectric converting element to values lower than the normal values for taking video, which signals correspond to sensor signals obtainable in a bright state for taking video.

26. (Original) A method of compensating for outputs of light sensor circuits of an image sensor as defined in claim 25, wherein ranges of changing the gain voltage and the drain voltage of the transistor to be lower than the normal voltages for taking video are of zero to values determined by subtracting a threshold voltage of the transistor from the normal gain voltage value and drain voltage value respectively.

27. (Withdrawn) A method compensating for the outputs of a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of compensating for variations in levels of respective pixel outputs in a dark state and a bright state by using as a dark-state pixel output a sensor signal obtained from each of the light sensor circuits when conducting the transistor with its gate voltage changed to a value higher than a normal value and its drain voltage equal to a normal value for taking video, and by using as a bright-state pixel signal a sensor signal obtainable by changing the drain voltage of the transistor to a value lower than the normal value for taking video.

28. (Withdrawn) A method of compensating for the outputs of device a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and working by

producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of previously setting a drain voltage of the transistor to a value at which a sensor signal obtained when conducting the transistor by changing its gate voltage to a value higher than a normal value for taking video may correspond to a sensor signal obtainable in a dark state at a normal gate voltage of the transistor and thereafter to compensate for variations in dark-state output level of each pixel signal by using as the dark-state pixel signal a sensor signal obtainable by changing the gate voltage of the transistor to a value higher than the normal value as a dark-state pixel signal and for variations in bright-state output level of each pixel signal by using as the bright-state pixel signal a signal obtainable by changing the drain voltage of the transistor to a value lower than the preset value.

29. (Withdrawn) A method of compensating for the outputs of light sensor circuits of an image sensor as defined in any of claims 27 and 28, including the step of initializing each of the pixels before taking video by discharging a charge accumulated in a parasite capacitor of each of the photoelectric elements by changing the drain voltage of the current-to-voltage converting transistor to a value lower than a normal value for a specified period.

30. (Withdrawn) A method of compensating for the outputs of a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of sampling and holding sensor signals read in a time series from respective pixels, obtaining pseudo bright output signals by decreasing by a threshold value the normal drain voltages of the respective transistors corresponding to respective pixels, calculating a difference between each of the obtained pseudo bright output signals and the corresponding sensor signals temporarily stored in the sample-and-hold step, and conducting the offset compensation of the previously set

bright reference signal by using the determined difference as the offset value.

31. (Withdrawn) An output compensating device of an image sensor using a number of light sensor circuits each representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, which provides a means for enabling the image sensor to compensate for a variation in each pixel output by using a sensor signal output from the corresponding light sensor circuit by conducting the transistor and changing a drain voltage of the transistor to a higher value or a lower value than the normal value for taking video by the image sensor while maintaining a gate voltage of the transistor at a constant value.

32. (Withdrawn) A method of compensating for the outputs of a number of light sensor circuits of an image sensor, each light sensor circuit representing a unit pixel and working by producing in a photoelectric converting element a sensor current proportional to a quantity of light falling thereon and converting the current into a voltage signal by using a sub-threshold region characteristic of a transistor having a logarithmic output characteristic in a weak inverse state and outputting a sensor signal corresponding to the converted voltage signal, comprising the steps of compensating for a variation in each pixel output by using a sensor signal output from the corresponding light sensor circuit by conducting the transistor and changing a drain voltage of the transistor to a higher value or a lower value than the normal value for taking a video by the image sensor while maintaining a gate voltage of the transistor at a constant value.